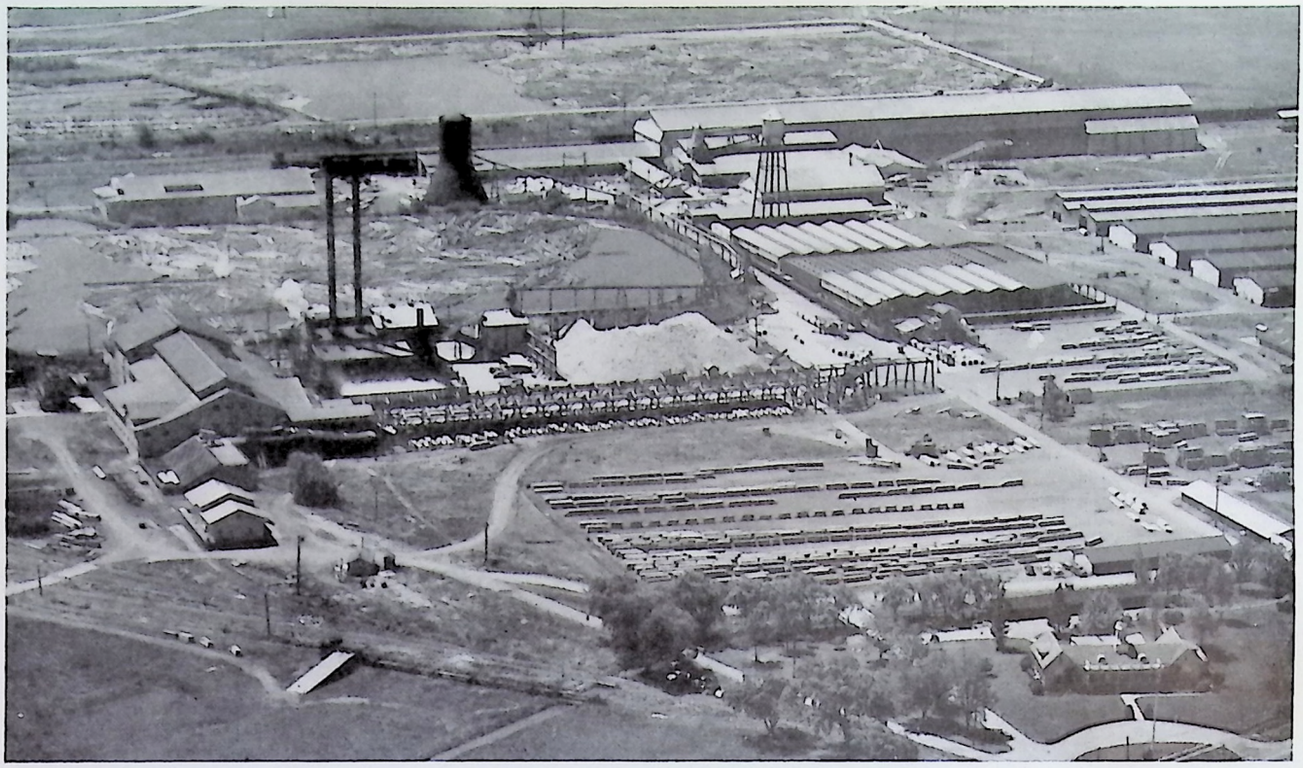


Recent aerial photograph of Medford Corporation plant. The power plant and fuel storage are shown at center of the picture between the sawmill at left and the dry kilns on the right.

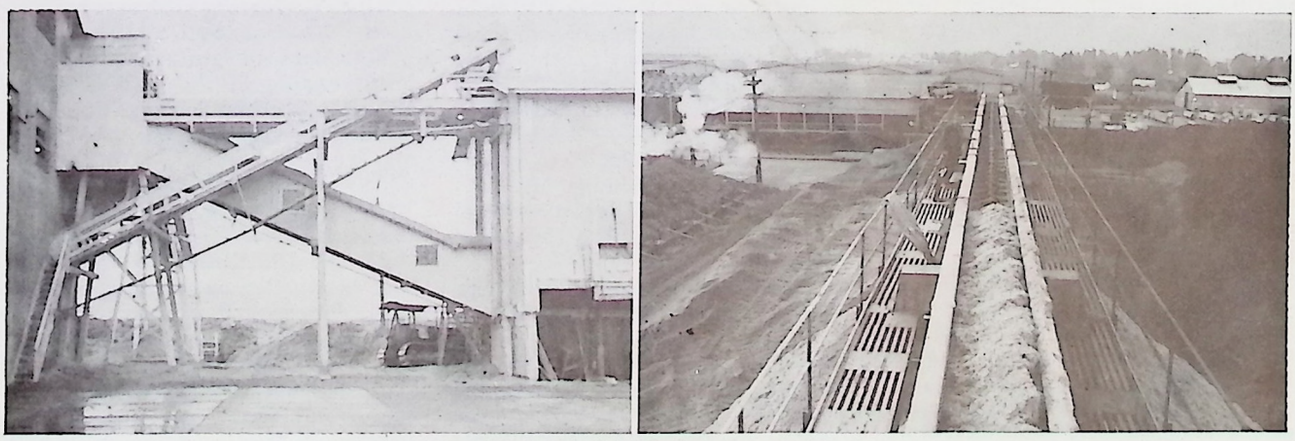
MORE POWER WITH LESS FUEL

MEDFORD CORPORATION FITS A NEW MODERN POWER PLANT INTO ITS WELL INTEGRATED FOREST PRODUCTS MANUFACTURING PLANT AT MEDFORD, ORE.

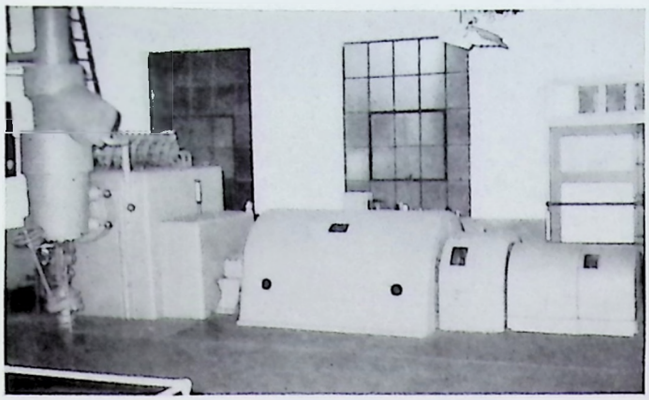
Oregon's Rogue river basin between the Coast and Cascade mountain ranges has undergone extensive expansion of population and industry in the past ten years. Medford, the principal city in the "Easy Valley," has not been slighted in this expansion. With increased population—and Oregon's population has increased about 40% since 1940, 5th greatest among the 48 states—homes have built up in the shadow of mills originally located considerable distance from residential and business areas. Besides, more mills have been built and established mills have expanded their operations, with result of a general increase of power consumption throughout the area.

Usual problems of community expansion appear to have become pronounced in the Medford area, perhaps chiefly due to this extraordinary rapidity and intensity of the increase in population and industry.

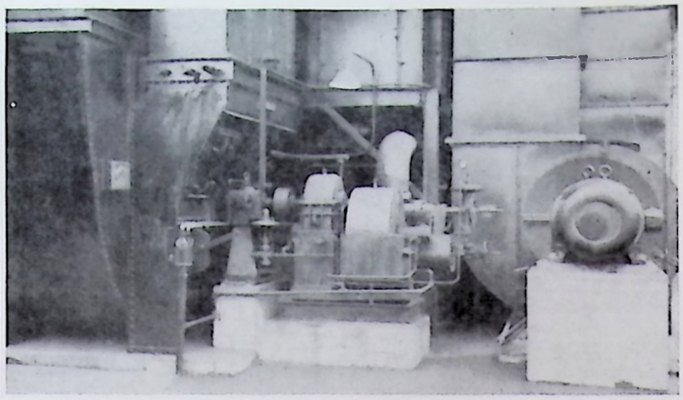
Of prime concern to the forest



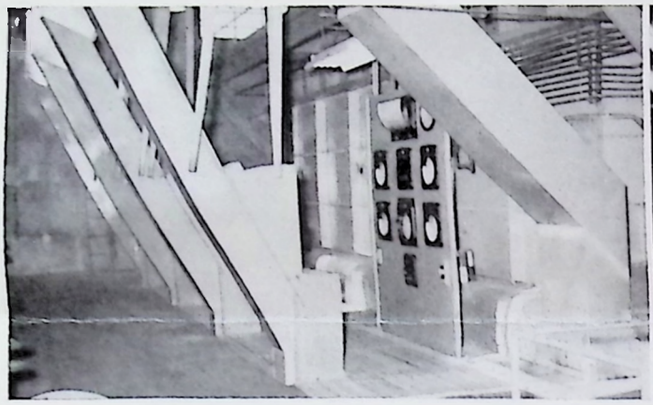
Fuel handling facilities between fuel storage and power plant at the Medford Corp., Medford, Ore. Left: Horizontal conveyor at top carries fuel from hog and sawmill to storage; the diagonal housed conveyor takes the stockpiled fuel to boiler room; and the open diagonal conveyor returns overflow from the boiler room conveyor to conveyor leading to storage. Right: Looking down on the Linn-Belt chain in concrete conveyor carrying fuel to storage.



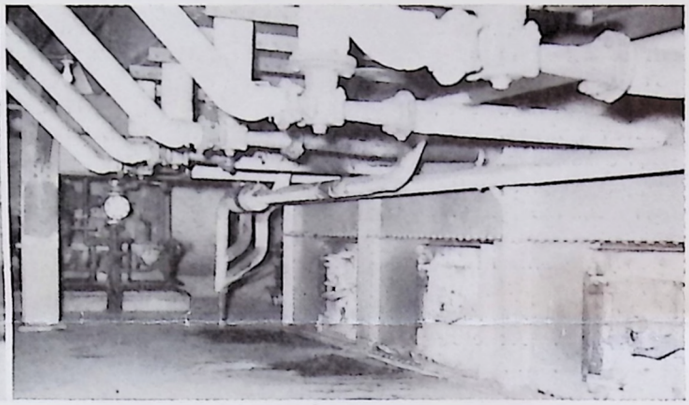
General Electric turbogenerator. G.E. 2500 k.w. 2400 volt generator driven by G.E. topping turbine utilizing 500 p.s.i. (inlet pressure) steam which is exhausted at 150 p.s.i. for operating two 1000 k.w. At left is main 500 p.s.i. header line feeding G.E. topping turbine.



Combustion controls: Left, Buffalo Forge induced draft fan driven by Elliott 300 h.p. steam turbine through Elliott reducer (center); right: Sturtevant silent vane forced draft fan driven by 75 h.p. Westinghouse constant speed motor. Whenever the ID fan changes speed the FD fan follows proportionately. Cinder collector hoppers are located behind ID fan drive.



Boiler room interior. At left are 4 spouts feeding fuel to the Riley Stoker Co. boiler. Hays and Foxboro boiler control instrument panel is shown at right.



The back of Riley boiler combustion chamber. Piping is for cinder reinjection to combustion chamber, from last pass of boiler and cinder collector hoppers located between building wall and ID fan.

products industries here has been the problem of smoke, sawdust, and cinders irritating home owners who have moved into the mill shadow; another confronting the expanding industry is that of keeping plant facilities within the scope of the installed power plant capacity.

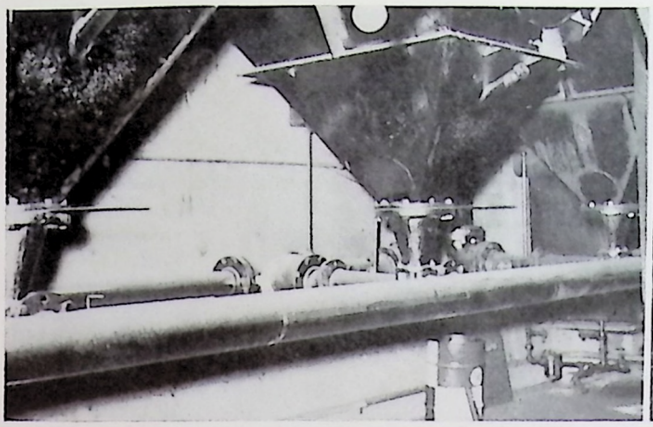
The Medford Corporation, a 250M sawmill with rather extensive remanufacturing facilities has eliminated these and some other operational problems through the expansion of its power plant. This organization, under the management of B. L. Nutting, utilizes virtually all wood waste of the plant, progressively eliminating practically every trace of cinders, sawdust, and smoke from the plant operations by converting all refuse wood material into additional power needed for operating the plant. Power in excess of the organization's remanufacturing needs is sold to a public utility.

This addition to the power plant was designed to efficiently meld with the 150 lb. steam generating facilities already furnishing electric power for the plant and at the same time providing steam in suitable pressure, temperature, and quantity for use throughout the plant. C. W. Cutler, Seattle, Washington, now in charge of Seattle's city light Skagit River development, officiated as over-all consultant for the Medford Corporation project, and E. P. Weiser, of Medford, carried on as supervising engineer. These were in addition to the plant's key supervisory personnel, including Mr. Nutting, Everett Gillespie, general superintendent, and Hans Holt, chief engineer.

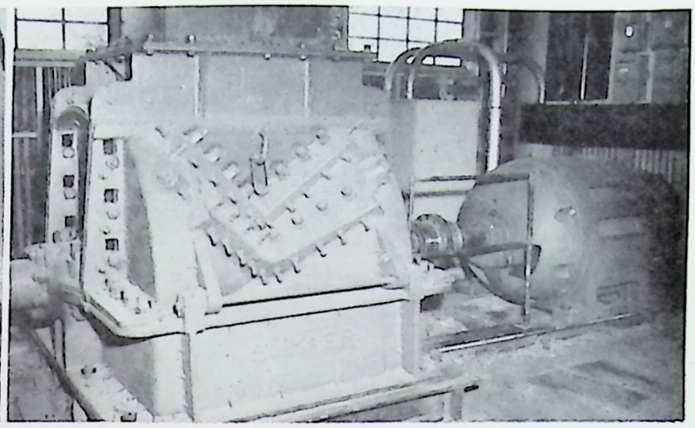
Steam for generation of electric power and for other usage through the plant is now provided by a new Riley Stoker Corporation boiler, from which the steam first goes through a new 2500 k.w. General Electric topping turbine at 520 lb. throttle valve pressure and 670 degrees temperature. Exhausting from the topping unit at 150 lb. pressure, 450 degrees, it then goes through a Schutte & Koerting desuperheater—leaving the steam with about 10 degrees superheat but pressure unchanged—to a header that supplies steam for further utilization including powering two 1000 k.w. Allis-Chalmers generators, 18-unit battery of dry kilns, sawmill, and shop. The Allis-Chalmers generators were, until cutting in the new addition, the plant's entire facilities for generating electric power.

New Plant Uses Less Fuel

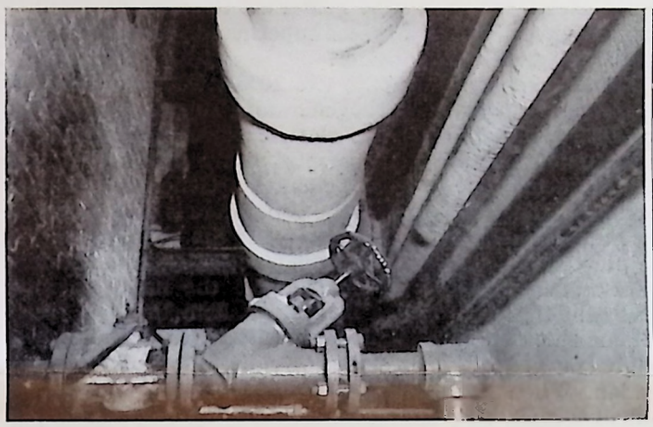
Regarding performance of this modern power plant, Mr. Nutting told The LUMBERMAN, "We find our new boiler, operating at 550 lbs. gauge pressure, to date is actually using less fuel to generate 100,000 lbs. of steam per hour than our two old boilers consumed in producing approximately the same hourly capacity at 150 lb. pressure. You might say that we are making twice as much steam in the one new boiler as we did in the two old ones with



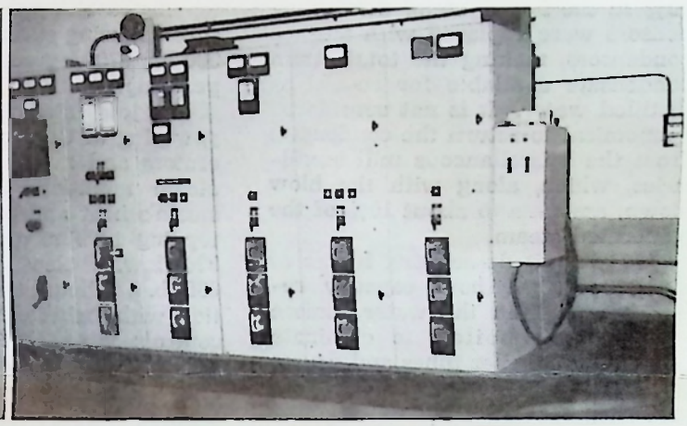
Western Precipitation Corp. cinder collectors removing fly ash and cinders from flue gases for return to combustion chamber.



Sumner 65 hog, powered with 250 h.p. G.E. motor, converts the low utility pieces of wood from sawmill into hog fuel for operating power plant.



Schutte & Hoerting venturi type desuperheater, on 150 lb. pressure steam line, for desuperheating steam from 630 to 375 degrees.



Westinghouse control panel with 2400-volt switch gear. Panel includes generator and exciter control for 2500 k.w. G.E. turbogenerator, synchronizing equipment for outside power and station auxiliaries, air circuit breakers, and voltage regulator.

less fuel so far as kilowatt generation is concerned, as we produce 2500 kilowatts through the new turbine by passing 100,000 lb. per hour of high pressure steam and having a 100,000 lb. of low pressure steam to use in our old system.

"Our expansion program was really designed on the basis of having an excess amount of fuel for a few years to come, as it is our thought that as time goes on we shall make further refinement from our waste that will naturally reduce the amount of fuel that will be available. Consequently, we will be using to a limited extent our sawmill refuse burner to consume the waste that is not now needed. Our burner was remodelled early in 1948 so that it is practically smokeless and does not throw cinders out through the screen."

The new 2-drum Riley Stoker Corporation boiler, with peak loading of 120,000 lb. of steam per hour, was installed by Bumstead-Woolford, Boiler Contractors of Seattle and Portland, as prime power source replacing two Stirling-type 170 lb. 10 degree superheat PSMD boilers which henceforth will be maintained as emergency stand-by units. The Riley boiler has a 4-cell dutch oven unit, using LaClede Christy fire brick. It is designed for 600 lb. steam pressure to furnish steam at 520 lb. pressure and 670-degree temperature at the main turbine throttle.

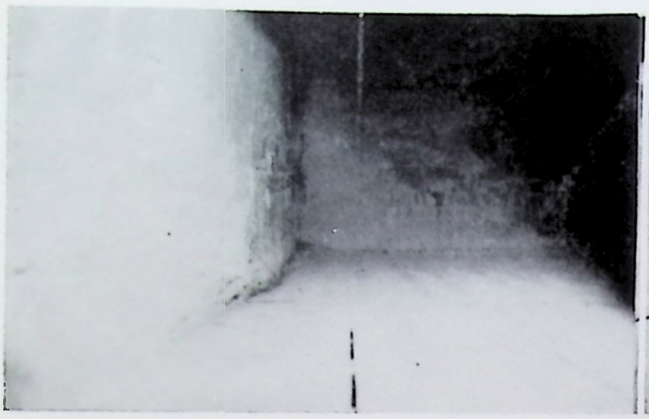
Cinders and Gases Eliminated

Furnace air is forced, by Sturdevant fan powered with 75 h.p. Westinghouse motor, through a Riley air heater and then under Olympic Foundry Company series 7500 Tawlk water-cooled dutch oven grates to the combustion chamber. The boiler combustion gases are removed by a Buffalo Forge Company induced-draft fan powered by 300 h.p. Elliott turbine and discharged through a 60 ft. stack to freely liberate the gases. No smoke or solids accompany the exhausted gases, according to Mr. Weiser; only clear gases are discharged from the stack. Cinders are eliminated from combustion gases by a Western Precipitation Corporation cinder collector and are reinjected into the boiler combustion chamber for complete burning. Hence the cinder problem has been eliminated at Medford Corporation plant.

Boiler operations are carried on by automatic controls, using combination of Foxboro and The Hays Corporation recorder-controllers and indicating controls, except that fuel feeding is by manual control. The dutch oven deck is air cooled by means of a separate fan.

Boiler feedwater pump facilities consist of two Warren 1510 ft. head multiple stage pumps, one powered by 150 h.p. Westinghouse electric motor and the other by 160 h.p. Elliott steam turbine.

For operating the new power plant system, raw-water makeup runs about 10%—at 100,000 lbs. of steam per hour raw-water makeup approaches 10,000 lbs. The two 1000 k.w. turbogenerators were previously using jet condensors. But to control raw-water makeup to about



Interior of a dutch oven cell showing LaClede Christy refractories. Tawlk water cooled grates are used in the cells.

Diagonal housed conveyor showing American 24" belt, riding on Link-Belt troughing rolls, carrying fuel to boiler room. Viking sprinkler system fire protection unit at top.

10% in the new system, these condensors were replaced with surface condensors, making the total steam condensate available for re-use as distilled water. It is not considered economical to return the condensate from the miscellaneous mill auxiliaries, which, along with the blow down, amounts to about 10% of the generated steam.

A Permutit de-aerating heater of 120,000 lb. per hour capacity removes air from the water, before reaching the boiler, to eliminate oxidation of boiler tubes and drums as well as heating feed water to 220 degrees. A Hall conditioning system treats the small amount of makeup water used.

Sawmill exhaust steam returning to the power plant goes through an oil-separation tank and then through anthracite coal filters for complete removal of oil before the condensate returns to the boiler. This oil filter system was supplied by the Northwest Filter Company of Seattle.

The new 2500 k.w., 2400-volt G.E generating unit powered with G.E. topping turbine acts as a steam pressure reducing station to convert the 500 lb., 670-degree (200 degrees superheat) steam to 150 lb. pressure 450-degree steam for subsequent powering of the two 1000 k.w. generators and manufacturing plant steam facilities. In reducing the steam's heat and pressure, the G.E. topping turbine generator develops 2500 k.w. of electric power. A 120,000 lb. per hour steam reducing station, with Fisher valves and Foxboro controls, is used in connection with the topping turbine that is in itself also a reducing station. When the topping turbine exhaust does not supply the 150 lb. header with the maximum steam flow demand, the reducing station automatically cuts in to supply additional low-pressure steam for the 150-lb. header. The reducing station itself does not cut in when the turbine is operating at full load. Steam from either or both the topping turbine and reducing station passes through a venturi type Schutte & Koerting Company desuperheater set to maintain about 10 degrees superheat in the 150-lb. mill header.

The two 1000 k.w. Allis-Chalmers turbogenerators supplied all of the mill's electric power generating requirements before addition of the G.E. generator. Generating voltage of all the generators is 480. This voltage, now as in the past, is stepped up to 2400 volts by transformers. At this voltage the new generator ties into the system through Westinghouse switch gear, which was installed by The Tide Co., industrial electrical contractors of Tacoma.

Key plant personnel concerned with power plant operation, left to right: E. G. Gillespie, general superintendent; Hans Holt, chief engineer; Ray Fernlund, power plant operator.

Surplus Power for Public Distribution

Until starting up the enlarged power generating system in March this year, the company's generating facilities were overloaded by requirements of the manufacturing plant. But now the combined output of the three generators, with normal rating of 4500 k.w., provides power in excess of the 2600 k.w. used in the plant and a balance of power for public distribution.

According to Mr. Nutting, the California-Oregon Power Company installed a 3-1000 k.v.a. transformer sub-station on Medford Corporation property and since August the power company has been taking "all of our excess kilowatts." As for the month of September, he says, "We sold them 1,750,000 kilowatts that we produced over and above our requirements. So long as the power company will accept off-peak kilowatts along with the peak power, we will in all probability be able to supply them 12 months out of the year with approximately the same number of kilowatts as was supplied in September."

"Wood by-products from the lumber manufacturing operations are first segregated removing the material which can better be utilized

for remanufacturing into lath, car strips, handle and shade roller stock; and waste suitable for use as domestic fuel is subsequently removed. The remainder is hogged for use as power plant fuel while building up winter fuel storage or when the mill sawdust and planer shavings are not coming to the boiler in sufficient amount to meet daily requirements of the furnace.

A Sumner 65 hog, powered by 200 h.p. G.E. motor, has been installed in the conveyor line between sawmill and burner for converting all unsalable waste wood from the sawmill into hog fuel. A Stearns Magnetic Manufacturing Magnetic drum installed ahead of the hog picks up tramp iron which would otherwise fall into the hog with the wood and cause considerable damage. The Diamond 45 hog which was used for hogging fuel for the former power plant is now used as a stand-by unit.

Fuel Handling Facilities

Hog fuel from the Sumner hog drops to a box-link chain transfer transporting it some twenty feet to a 310 ft. long, 24 in. wide belt conveyor taking the fuel past the power plant to a 50 ft. same width belt conveyor inclined upwards at 24 degrees. This belt discharges the fuel to either a box-link chain conveyor feeding the dutch ovens, or to No. 678 Link-Belt chain conveyor, with 2 inc. angle flights, taking fuel to outside storage. This conveyor, located 30 ft. above the ground, passes under a cyclone receiving shavings from the planing mill. Here the shavings drop from the planing mill. Here the shavings drop into the conveyor which already carries sawdust and hog fuel enroute to storage. These three types of fuel become mixed together before feeding to the boiler.

The conveyor structure over storage area is 120 ft. long and built entirely of concrete, the concrete conveyor starting at shavings cyclone. Conveyor trough is 20 by 25 in. inside dimensions. The 678 Link-Belt rivetless conveyor chain carrying fuel to storage travels 60 l.f.p.m., has 208 ft. centers, and is powered by a 30 h.p. Westinghouse motor through 100:1 Sumner reduction gear.

From storage to power plant, fuel is first transported by Link-Belt 678 chain riding in 20 by 25 in. concrete conveyor trough, the top of which is at ground level. This 200 ft. long conveyor is covered over with 3 ft. long plank except when storage fuel is to be used for generating power. Storage fuel is piled and fed back into the conveyor by tractor-mounted bulldozer. A 20 h.p. Westinghouse motor, driving through Sumner 80:1 reduction gear, powers this conveyor chain. A 3500 unit storage area is provided where the fuel is stored by the dozer. This amount of fuel is estimated to be sufficient to operate the boiler at capacity for one month.

From the 678 chain conveyor, fuel from storage feeds onto a 24 in. rubber-belt 90 ft. conveyor leading upward at 18 degree incline toward the power plant, discharging the fuel to dutch oven feed chain.

These rubber-belt conveyors, including the main 310 ft. unit from near the hog and both inclined conveyors, use American Rubber & Manufacturing Company rubber belting bought from The Lorenz Company. The loaded belting travels on Link-Belt troughing rolls and returns on Link-Belt idlers. The longest of the three belt conveyors travels 320 f.p.m. and is powered with 7½ h.p. Westinghouse gearhead motor. Of the two inclined conveyors, the 50 ft. unit receiving from the main conveyor is powered by a 5 h.p. Westinghouse gearhead motor, and the other powered at 300 f.p.m. by 3½ h.p. Westinghouse gearhead motor.

The Medford Corporation's use of concrete fuel conveyors and topping turbine to conserve steam is thought to be the original such installation in the Northwest lumber industry. Extensive travels throughout the area by The LUMBERMAN editors have not previously revealed such an installation, nor has recent inquiries to power plant equipment firms disclosed information concerning other installations of this type.

Construction work on the Medford Corporation power plant project was by Bessonette & Graff, Medford contractors who also designed and built the concrete fuel conveyors.

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